Electron Microscopy Center

JEOL JEM-3010 TEM

FUNCTION: Performs basic and applied research in areas of marine geosciences, geophysics, physics, and microbiology using microanalytical techniques.

INSTRUMENTATION: The facility has a JEOL JEM-3010 transmission electron microscope (TEM) equipped with an energy-dispersive x-ray spectrometer (EDXS), Gatan Model GIF200 (Gatan Imaging Filter) for energy filtered imaging and electron energy loss spectroscopy (EELS), and scanning coils for scanning TEM mode. This TEM has a state-of-the-art environmental cell (EC) system with two interchangeable EC specimen holders. The center is also equipped with a Hitachi H-600 TEM and an environmental scanning electron microscope (ESEM).

DESCRIPTION: The Marine Geosciences Electron Microscopy Center has unique instrumentation in its environmental cell (EC) transmission electron microscope (TEM) system. The EC is of the closed-cell type and is fully computer-controlled. Unlike EC systems based on the principle of differential pumping, closed-cell EC systems require no modification to the TEM. Confinement of the pressurized environment within the EC is achieved with electron-transparent windows. Since the EC is self-contained within the specimen holder, the TEM can still be used for conventional transmission electron microscopy using conventional specimen holders without compromising resolution and analytical capabilities.

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Sediment Physical and Geoacoustics Properties and Sediment Biogeochemistry Laboratories

Sediment Physical and Geoacoustics Properties Laboratory

FUNCTION: Provides instrumentation and expertise for both biogeochemical experiments and analyses for the understanding of sediment early diagenesis, and for physical and geoacoustic characterization of marine sediments from all depths and regions of the oceans.

INSTRUMENTATION: Wet chemistry facility, centrifuge, spectrophotometer, benthic mesocosm tanks with circulating water, equipped with O_2 and pH microprofilers, a Geotek multisensor core logger, Faxitron x-radiography system, digital macro- and micro-photographic imagery systems, and geotechnical testing instrumentation that includes miniature vane shear and torvane, uni- and triaxial consolidation instruments, geoacoustic Hamilton frame, relative density shaker table, and Quantachrome Ultrapycnometers (Model 1000). Sediment textural analyses are routinely performed using standard sieves, pipette analysis, a computerized and instrumented in-house developed settling tube, and a Micromeritics Sedigraph, Model 5000ET.

DESCRIPTION: The sediment biogeochemical laboratory consists of benthic mesocosm tanks that simulate heavily bioturbated sediments. The sediment and interstitial waters are analyzed in the wet chemistry lab for their cation and nutrient content. The multisensor core logger measures profiles of compressional wave velocity and wet bulk density (by gamma ray attenuation) directly, and acoustic impedance and porosity indirectly; an X-ray radiography unit (Faxitron) provides images of sediment stratigraphy, bioturbation, and inclusions. Sediment cores are opened and split for visual classification, measurement of undrained shear strength via miniature vane and torvane, and subsampling for physical properties tests. Grain-size analyses for coarse sediments are performed by settling tube or standard sieve analysis, and silt and clay size particles are analyzed by Micromeritics Sedigraph. Average grain densities are measured via gas pycnometry using a Quantachrome Ultrapycnometer. Geoacoustic properties are measured using a Hamilton frame. Sediment compressional, undrained and drained shear strength, and geoacoustic properties are measured using 1-D consolidometers and triaxial testing machines.

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Moving-Map Composer (MMC) Facility

Moving-Map Composer Facility

FUNCTION: Develop, test, and transition software and algorithms to perform database design, data compression, data fusion, archival, retrieval and display. Demonstrate and evaluate prototype and next-generation digital moving-map capabilities, map design systems, and mission planning systems.

INSTRUMENTATION: The MMC facility includes multiple computer platforms running Unix, Linux, Windows NT, and OpenVMS operating systems.

DESCRIPTION: The MMC Facility is a 32 × 30-ft laboratory located in the D-wing of Bldg.1005 at the Stennis Space Center, MS. The facility is divided into four primary work areas to support the principal functions of the MMC team:

- Research into data compression and database design
- Development and transition of mission-specific aircraft optical disks for F/A-18 and AV-8B platforms
- Software and algorithm development in support of naval mission and map planning
- Developing, testing, prototyping and demonstrating parallel processing techniques to improve efficiency of existing bathymetric data processing systems.

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